

IN THE SPECIFICATION:

Please make the following amendments to the specification in the indicated paragraphs.

[0006] According to the invention there is provided a handling system for incorporation in a trailer for use with palletized freight. The handling system incorporates a segmented, translatable platform. Among the segments is a principal or main segment which supports the palletized freight during shipping. The main upper surface of each of the segments is a conveyor. The conveyors are aligned from segment to segment to allow cooperative movement, respacing and off loading of the palletized freight on and between the segments and off of an end segment. The platform translation system allows the platform to be extended from an open end or side of the trailer. The segmentation of the platform allows use of the end and a mid segment to lower a piece of palletized freight to a surface below the level of the main segment of the platform.

[0021] Referring now to the figures and in particular to **Figs. 1 and 2**, a trailer **10** incorporating a translatable, segmented platform **11** for palletized freight modules 19 is shown. Translatable platform **11** is, in its retracted position within trailer **10**, and fully supported on the bed **47** of the trailer (see **Figs. 8, 9**) and may be repositioned as a unit off the bed through an opening in the trailer, such as end opening **17**. As shown in **Fig. 1**, the portion of translatable, segmented platform **11** moved out of the trailer **10** may come to rest on the upper or target surface **13** of a raised loading dock **15**. Translatable, segmented platform **11** provides a support floor for a plurality of palletized freight modules **19**. The preferred embodiment of the invention works best with freight that is bundled into standard sizes with a standard orientation, here termed palletized freight modules 19 units, although it is not intended that the invention as claimed be limited to freight of such character.

[0022] Translatable, segmented platform 11 comprises three segments in the preferred embodiment, including an end segment 21, a mid segment 23 and a main segment 25. Each segment 21, 23, 25 has a distinct function and each segment has its own, independently actuatable conveyor. These include an end segment conveyor 27 and a mid segment conveyor 31. End segment 21 is articulated with mid segment 23 along adjacent edges and mid segment 23 is articulated with main segment 25 along common edges. The axes of articulation are parallel and horizontally disposed allowing mid segment 23 to be rotated downwardly from one end of main segment 27 25 and end segment 21 to be rotated upwardly from one edge of mid segment 23. Hydraulic pistons actuators, including hydraulic piston actuator 35, connected between mid segment 23 and end segment 21, are used to rotate the segments 23, 21. This allows end segment 21 to be lowered to and placed parallel on a supporting surface 33 while remaining flat. End conveyor 27, mid segment conveyor 31 and the conveyor 41 for main segment 25 are aligned for cooperation and may be operated in a fashion to separate the end or "current last in" palletized freight module unit 19 from the remaining modules units. This separation allows the current last in palletized freight module 19 unit to be lowered to the target surface 33 on segment 21 and moved off of end segment 21 at end 29.

[0023] Referring now to **Figs. 3 and 4** translation and positioning of the segments of platform 11 is illustrated. Translation of the segments 21, 23, 25 occurs as a unit, that is platform 11 may be moved horizontally in and out trailer 10 from a fully retracted position "A" on bed 13 47, to an intermediate position "B" and finally to a position of maximum extension "C" where only a small portion of the platform 11 remains in trailer 10 and supported on the bed 47. Translation occurs through an opening 17 in the trailer 10, typically at one end of the trailer, although it is conceivable that it could be done toward a side of the trailer. Platform 11 is illustrated in a reconfigured shape "D" where mid segment 23 has been rotated in a clockwise direction A as viewed in **Fig. 5** and end segment 21 has been simultaneously and synchronously rotated in a counterclockwise direction B to drop the level of end segment 21 below the

level of main segment 25. Hydraulic pistons actuators 35 and 37 are pivotally coupled between end segment 21 and mid segment 23 (for piston actuator 35) and mid segment 23 and main segment 25 (for piston actuator 37). Contraction of the pistons actuators operates to introduce a fold in the platform 11 as illustrated in **Fig. 5**, while extension of the pistons actuators straightens the platform 11. Strain on midsegment mid segment 23 is minimized by providing that the points of attachment of hydraulic pistons actuators 35 and 37 on midsegment 23 are collocated.

[0024] As illustrated in **Fig. 6**, translatable, segmented platform 11 is installed on the bed 47 of trailer 10, and is preferably made as compact as possible in the vertical dimension to minimize the amount of space occupied. ~~Freight is~~ The palletized freight modules 19 are preferably kept on main segment 25 during shipping, but the trailer 10 may be filled, with modules cargo carried on all of the segments 21, 23, 25 if the destination has a raised dock. Otherwise, enough of platform 11 must be kept clear of palletized freight modules 19 cargo to allow mid segment 23 to be cleared of modules pallets for rotation out of the horizontal when it is necessary to lower end segment 21. It is conceivable that platform 11 could be adapted to fold end segment 21 and mid segment 23 upwardly within trailer 10 to conserve space, or that the two segments could be detached from the main segment 25 and carried beneath the bed 47. Either adaptation can be expected to add considerable mechanical complexity to the system.

[0025] Conveyors 27, 31, 41 can operate simultaneously with translation of the translatable, segmented platform 11. As illustrated in **Fig. 7**, platform 11 is being withdrawn into trailer 10 in the direction indicated by the letter B N while end conveyor 27 moves a palletized freight module pallet 19 off the end 29 of the platform 11 (direction M). Preferably the velocity of platform 11 cancels the velocity of the upper surface of conveyor 27 relative to the ground so that the velocity of the current last in palletized object 19 is also zero relative to the surface (13 or 33) on to which it is transferred. Simultaneously, the remaining palletized freight modules objects 19 are moved toward the opposite end (direction O) of platform 11 at the same time the platform 11 is withdrawn into the trailer 10. Motion may be ramped up and down to

avoid tumbling palletized freight modules 19 the cargo on account of their its inertia.

[0026] Translation of platform 11 is preferably confined to a straight line. Referring to Fig. 8, it may be seen that platform 11, within trailer 10, rolls along parallel tracks 45 running lengthwise along the bed 13 47 of trailer 10. Translatable, segmented platform 11 may be moved by any number of devices. Here a translation mechanism 43 is provided by an elongated worm gear coupled into the main segment 25. Conveyors 27, 31 and 41 are located to provide the upper surfaces of end segment 21, mid segment 23 and main segment 25, respectively. The worm gear translation mechanism 43 is coupled to main segment 25 below the level of conveyor 41. The conveyors 27, 31, 41 are aligned on one another and travel on parallel axles allowing packages to be freely moved from one conveyor to an adjacent conveyor.

[0027] Each segment 21, 23, 25 of translatable, segmented platform 11 comes with a plurality of wheel assemblies 51 such as illustrated in Fig. 9 which extend from the sides (or from the bottoms of the segments 21, 23, 25 along the sides thereof) of the segments 21, 23, 25 aligned with the direction of travel of the platform. Wheel assemblies 51 are set in the tracks 45 allowing to and fro movement of platform 11 in the direction of elongation of the tracks 45.

[0028] Referring to Fig. 10 a hinge or joint 53 providing articulation between main segment 25 and mid segment 23 is illustrated. Joint 53 is located along the lower surfaces of the segments 25, 23 and toward the outside edge of the segments 25, 23 allowing mid segment 23 to articulate downwardly from main segment 25. A similar joint (not shown) is provided between mid segment 23 and end segment 21, except that it is located along the top surfaces, outside of the conveyors 27, 31, allowing the end segment 21 to rotate upwardly from the mid segment 23.

[0029] Operation of the translatable, segmented platform 11 is illustrated in Fig. 11. Operation is typically done by the truck operator using a control interface positioned to allow the process to be directly watched. At step A Q an array of palletized freight modules units 19 designated A-D W, X, Y and Z are situated on main segment 25 of translatable, segmented platform 11. This is a preferred position for the palletized units

19 during shipping. Where the destination is a facility that requires use of platform 11 to lower palletized freight modules units 19 enough space must be left on platform 11 to allow the palletized freight modules 19 units to be positioned so that mid segment 23 is clear of any modules units. One palletized freight module unit 19 is positioned on end segment 21 during lowering operation.

[0030] Moving to step B R the process of repositioning palletized freight modules units 19 is illustrated. Conveyors 41, 31, 27 installed on main segment 25, mid segment 23 and end segment 21 operate to move all four palletized freight modules 19 units toward the end segment as indicated by arrow E. Once the current last in last-in palletized freight module unit 19, designated A W, is fully off of main segment 25, the conveyor 41 for main segment 25 stops while the conveyors 31, 27 for mid segment 23 and end segment 21 continue to run to move the "W" designated palletized freight module 19 in the direction F until the current last in palletized freight module unit 19 is fully off of the mid segment and preferably positioned centered on end segment 21 as illustrated in step C S.

[0031] The palletized freight module unit 19 disposed on end segment 21 may or may not need to be lowered to ground level. The process is illustrated as including a lowering step D T. Mid segment 23 is pulled by pneumatic hydraulic actuators 37 contracting to rotate the segment counter-clockwise as indicated at H. Simultaneously, end segment 21 is kept level by retraction of pneumatic hydraulic actuators 35, the segment rotating clockwise synchronously with mid segment 23 as indicated by the letter I. Sensors may be disposed on the bottom of end segment 21 to determine when the segment is fully supported from underneath. Next, at step E U, translatable, segmented platform 11 is withdrawn in the direction indicated by the letter K while the conveyor 27 for end segment 21 operates to move the "W" palletized freight module unit 19 off of the end 29 of end segment 21. "W" palletized freight module Palletized unit 19 preferably has a zero velocity relative to the target surface 13 or 33.

[0033] Hydraulic fluid is stored in a reservoir 59 and delivered by a hydraulic circuit to pumps 71 and 72. Pump 71 supports operation of the conveyors 27, 31 and

41. The hydraulic circuit supporting conveyor 27, 31, 41 operation includes three valve bodies 73, 74 and 75 which deliver fluid to hydraulic motors 79, 80 and 81, respectively, to operate motors 79-81 in either of two directions. Since each motor 79, 80, 81 is controlled by its own valve body 73, 74, 75, the motion of the conveyors 27, 31, 41 may be coordinated, or any one may be independent of the remaining conveyors. A valve controller 65 coupled to data bus 61 controls operation of the valve bodies 73-75 under instruction of microcontroller 57.

[0035] Translation of platform 11 is performed by a translation mechanism 43, which may be implemented in a worm gear arrangement or other mechanical arrangement for converting rotational motion of a motor 87 to linear movement. Additional motors 83 and 85 are provided for pumps 71 and 72, respectively. All three motors 83, 85, 87 are under the control of a motor controller 63. Motor controller 63 operates under the control of microcontroller 57. Feedback to the operator over interface 67 may be provided by the inclusion of sensors which generate information relating to the position of packages on the platform 47, support of the platform from below, or extent of extension of platform 11. To this end various pressure sensors 89A-B, position sensors 91A-C and translation extension sensor 93 may be provided. Pressure sensors 89A and B may provide operational information relating to status of the hydraulic circuits. Position sensors 91A-C may be various types of transducers used to locate palletized freight modules units 19 or the location of segments 21, 23, 25. Lastly, data bus 61 is coupled, either directly or indirectly, to a trailer suspension control system 69 to allow the trailer height to be adjusted to bring the bed 47 of the trailer 10 level with a raised dock.

[0036] The invention provides a compact, on board cargo handling system for a trailer 10 which is useable at both improved and unimproved locations for unloading of cargo such as palletized freight modules 19. While not directed to cargo loading of palletized freight modules 19, the system can be used to reposition cargo modules on board without the need to drive a forklift truck onto the bed 47 of the vehicle trailer 10.